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(71) Applicant(s)
Robert Bosch GMBH

(Incorporated in the Federal Republic of Germany)

D-70442 Stuttgart 30, Federal Republic of Germany

(72) Inventor(s)
Karl Frauhammer
Frank Mueller
Georg Weeber
Martin Rittner
Heinz Schnerring

(74) Agent and/or Address for Service
A A Thornton & Co
Northumberland House, 303-306 High Holborn,
LONDON, WC1V 7LE, United Kingdom

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GB 1447867 A EP 0419866 A

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(54) Hammer drill speed controller

(57) A hammer drill having an electric motor with an electronic control device 7, has a mode selector switch 20 combined with a speed control switch 3 to alter the motor speed in different modes. Selection of cutting mode by means of switch 20 also operates a contact switch 3 which, via resistors 4, 5 and electronic control device 7, alters the speed of the motor. The contact switch 3 may be activated by a nub 2 on the mode selector switch or by a wedge (6, Fig. 2). The motor armature 8 may include a magnetic ring having a number of poles 9 which when rotated are sensed by an inductive pick-up 11 to control the motor speed via controller 7.

Fig.1

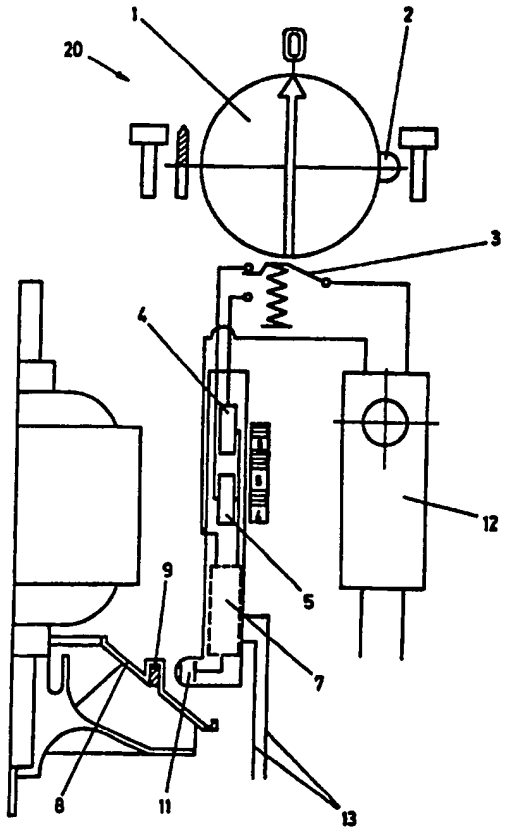

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Fig.1

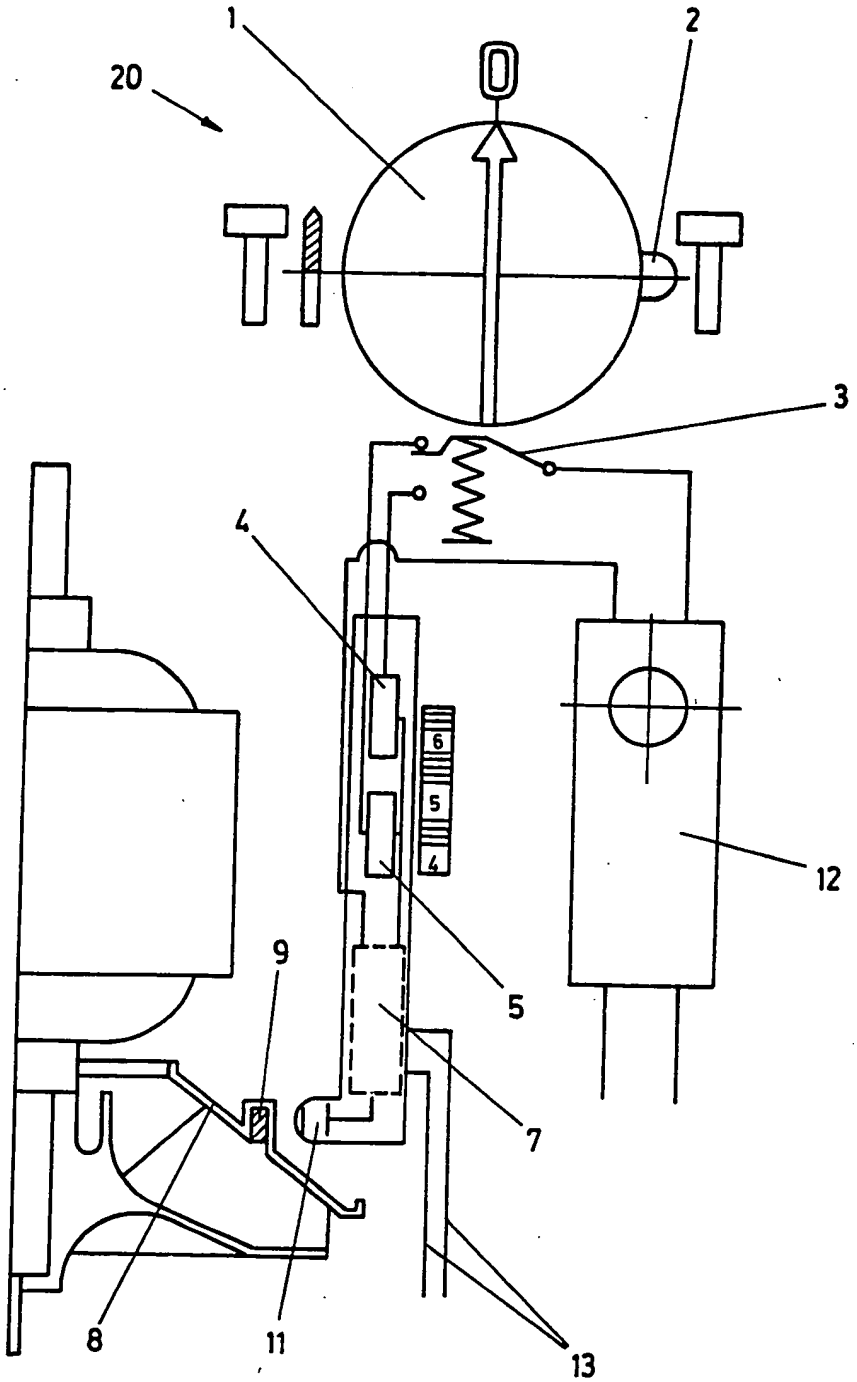
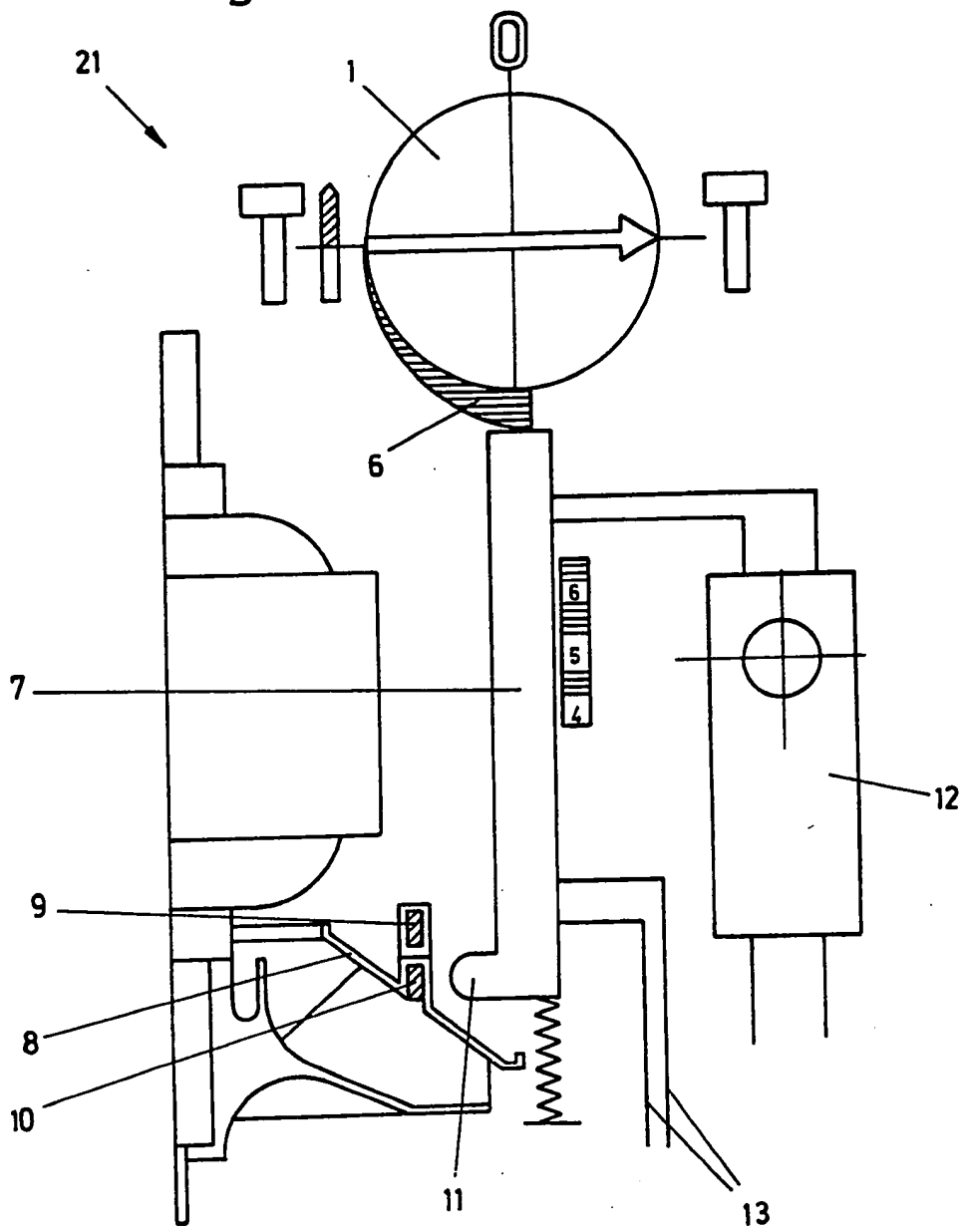


Fig. 2



Hammer drill

Background art

The invention relates to a hammer drill of the type described in the preamble of claim 1.

Such combination appliances, because of their versatility, are frequently used both industrially and non-industrially. For an example of how the rotation of the motor shaft is translated into the rotary movement of the drill chuck or the hammering movement of the impact mechanism or into a combined movement and of how the changeover between the corresponding modes of operation may be realized, reference is made to DE-OS 39 32 413. Likewise known from background art are electronic control devices for hammer drills, which keep the motor speed constant. The electric power output of the motor is determined by the drill drive and by the impact mechanism. Because of the heavy load especially in drills with a high drilled diameter, a much higher output is required for the drill drive than for the impact mechanism in cutting mode. Consequently, the electric power output of the motor is utilized fully only during impact drilling and only to around 70 - 80% in pure cutting mode. Since, in 50 - 70% of cases where medium- and heavy-duty hammer drills are used, cutting mode is selected, for more than half of the time work is being carried out below the maximum power output. The result is a disproportion between weight and output of the machine, which is a source of dissatisfaction in the user. The user is therefore faced with the choice of accepting said drawback or using separate appliances for drilling and for cutting, which

in turn have the drawbacks of a higher cost-price, a greater spatial requirement and a greater total weight.

Advantages of the invention

With the hammer drill according to the invention, work may be carried out both in drilling and in cutting mode utilizing 100% of the rated motor output.

This is achieved by the characterizing features of claim 1. With the increase in the motor speed, the impact rate is increased and so, in cutting mode too, there is a higher maximum output. The selection of the mode of operation and the speed increase is effected simultaneously by means of the mode selector switch.

Preferred constructional forms of the invention are characterized in the sub-claims and are explained in part in connection with the description of the variants of the invention illustrated in the drawings.

Drawings

Embodiments of the invention are illustrated in the drawings and explained in greater detail in the following description. Figure 1 is a diagrammatic view of a first embodiment having a switchable resistor and Figure 2 is a diagrammatic view of a second embodiment having a displaceable inductive pickup.

Description of the embodiments

In the drawings, two different possible constructions are diagrammatically illustrated. Fig.1 and Fig.2 each show a changeover device 20, 21 which in each case cooperates with an electronic control device 7, which is connected by a master switch 12 to the network and controls the motor via lines 13.

A changeover device 20 shown in Fig.1 is provided with a mode selector switch 1 having on its periphery a nub 2 which, upon rotation of the mode selector switch 1 into a position corresponding to cutting mode, operates a momentary-contact switch 3 and hence connects a resistor 4 in series to the electronic control device 7 of the motor. In drilling or impact drilling mode, on the other hand, the momentary-contact switch 3 is situated in the illustrated position and the resistor 5 is series-connected to the electronic control device 7. In the illustrated example, the resistor 4 has a lower resistance value which allows a higher rated speed of the motor in cutting mode so that, in cutting mode too, maximum utilization of the power output is possible. By rated speed is meant the maximum speed of the motor in a specific mode of operation. The actual motor speed may however be reduced, for example, by means of a known hand-operated trigger switch.

It is possible to use, instead of the mechanical momentary-contact switch, a proximity switch such as, for example, a reed contact or Hall-effect sensor, in which the contact is not so strongly exposed to external influences.

Naturally, the trimming resistors 4 and 5 may alternatively be switched in some other way, provided that they meet the requirement of increasing the rated speed of the motor upon operation of the switch 3.

The armature 8 of the motor includes a magnetic ring 9 having a specific number of poles so that, upon rotation of the armature 8, an inductive pickup 11 of the electronic control unit 7 lying opposite the magnetic ring 9 supplies a signal, whose clock pulse corresponds to the motor speed. The electronic control device 7 maintains the clock pulse at a preselected value which corresponds to the rated motor speed.

Fig.2 shows a second changeover device 21 having, on the periphery of the mode selector switch 1, a wedge 6 which extends over approximately 90° and whose higher end, upon setting of the mode selector switch 1 to cutting mode, displaces a slide carrying the electronic control device counter to the force of a spring parallel to the motor shaft. In the present example, the armature 8 of the motor has two magnetic rings 9, 10, which are disposed one behind the other in relation to the direction of the motor shaft. In drilling or impact drilling mode, the inductive pickup 11 of the electronic control device 7 lies opposite the magnetic ring 9, which has a specific number of poles. In cutting mode, the electronic control device 7 and hence also the inductive pickup 11 are displaced by the slide and the inductive pickup 11 lies opposite the magnetic ring 10, which has a lower number of poles. The consequently reduced clock pulse of the signal supplied by means of the inductive pickup 11 of the control device 7 leads to a control process, which increases the rated speed of the motor in order to keep the clock pulse constant. As a result, the desired increase in the rated speed in cutting mode is again achieved. To change the rated speed of the motor in accordance with the selected mode of operation, it is sufficient to shift the inductive pickup 11 opposite the magnetic rings 9, 10. The control device 7 may alternatively be mounted in a housing-fixed manner.

Claims

1. Hammer drill having an electric motor and an electronic control device (7) for maintaining a preselected rated speed of the electric motor during operation, wherein a drilling mode, cutting mode or combined impact drilling mode is selectable by means of a mode selector switch (1), characterized in that the hammer drill is provided with a changeover device (20, 21) for the electronic control device (7) which is operable by means of the mode selector switch (1) in such a way that the rated speed of the electric motor in cutting mode increases compared to the rated speed in the other modes of operation.

2. Hammer drill according to claim 1, characterized in that associated with the electronic control device (7) are two trimming resistors (4, 5) which by means of an electric switch (3) coupled to the mode selector switch (1) are alternatively operated as a series resistor influencing the motor speed, the rated motor speed being increased upon setting of the mode selector switch (1) to cutting mode.

3. Hammer drill according to claim 2, characterized in that the electric switch (3) is a momentary-contact switch which is operable by means of a nub (2) provided on the mode selector switch (1).

4. Hammer drill according to claim 2, characterized in that the electric switch is a proximity switch such as, for example, a reed contact or a Hall-effect sensor.

5. Hammer drill according to claim 1, characterized in that the electronic control device (7) comprises an inductive pickup (11) via which, by means of a first magnetic strip (9) having a specific number of poles and situated in the armature of the motor, a signal having a clock pulse corresponding to the motor speed is supplied to the control device, that the armature comprises a second magnetic strip (10) having a different number of poles and that the inductive pickup (11) is displaceable by means of the mode selector switch (1), the inductive pickup (11) being movable from a position opposite one of the magnetic strips (9, 10) into a position opposite the other magnetic strip (9, 10), the rated motor speed being increased upon setting of the mode selector switch (1) to cutting mode.

6. A hammer drill substantially as herein described with reference to Figure 1 or Figure 2 of the accompanying drawings.

The Patent Office

Application No: GB 9500240.8
Claims searched: 1-6

Examiner: Hal Young
Date of search: 26 April 1995

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.N): B4C

Int Cl (Ed.6): B23B (45/16) ; B25D (16/00; 17/00)

Other: ONLINE : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB1447867	(BOSCH) see page 1 lines 41-60.	1
A	EP0419866 A2	(BOSCH) see whole document.	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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